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VERIFICATION OF TRANSLATION

Assistant Commissioner for Patents

Washington, DC 20231

Sir:

I, Jeffrey D. Tekanic, am employed by Kramer Barske Schmidtchen of Radeckestrasse 43, Munich 91245, Germany, and declare that:


1) I am conversant in both German and English;

2) I have prepared the English translation of International Application No. PCT/DE2004/01485 and, to the best of my knowledge and belief, the English translation is a true and accurate translation of the substance of the above-identified International Application; and

3) all statements made of my own knowledge are true and all statements made on information and belief are believed to be true, and further these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 USC 1001, and such false statements may jeopardize the validity of the application or any patent issuing thereon.

9 January 2006

Date



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Convertible Vehicle and Hinge Device

[0001] The invention relates to a convertible vehicle, as well as a hinge device arranged between a rear trunk lid of a convertible vehicle and a tensioning bow for tensioning the rear side of the convertible top.

[0002] Convertible vehicles are enjoying increasing popularity. When vehicles have a short rear end, a small clearance width results between the tensioning bow of the convertible top, which tensioning bow downwardly tensions the rear side of the convertible top, and the loading edge of the trunk space. At best, this small clearance width, which will be designated as the loading dimension (L206), is acceptable for an opened convertible top, when the convertible top, which is opened and mostly stowed in the trunk, severely reduces the volume of the trunk space. When the convertible top is closed, however the reduced loading dimension is very disadvantageous, because the capacity of the trunk space is then barely limited by the convertible top and can also accommodate larger objects.

[0003] In German Utility Model DE 94 19 035 U1, it is proposed to attach the rear side of the convertible top directly to the rear trunk lid, so that, upon opening the rear trunk lid, at least the rearward portion of the convertible top is correspondingly opened therewith, and the loading dimension is not compromised by the convertible top. A peculiarity of this proposal consists in that the opened convertible top lays on the rear trunk lid and must, as a whole, follow an opening of the rear trunk lid, whereby the convertible top kinematics are restricted.

[0004] The object underlying the invention is to create a solution for the problem that, for vehicles having a short rear end and equipped with a convertible top, the loading capability of the trunk space is significantly restricted, without the existence of above-noted restrictions of the convertible top kinematics.

[0005] This object is solved with a convertible vehicle according to claim 1.

[0006] According to the inventive convertible vehicle, the rear trunk lid encompasses the tensioning bow of the convertible top from behind, so that it is recessed in correspondence to the shape of the tensioning bow, wherein, in particular in the middle region of the vehicle, the rear end of the rear trunk lid can be disposed only slightly behind the tensioning bow. The tensioning bow and the rear trunk lid are stored in their own storage spaces in the vehicle body, wherein for the opening up of an adequate luggage loading opening, the tensioning bow

can be upwardly pivoted during opening of the rear trunk lid in coordination with the opening movement of the rear trunk lid or independent of the rear trunk lid.

[0007] The dependent claims 2 to 6 are directed to advantageous embodiments and further developments of the inventive convertible vehicle.

[0008] Claim 7 denotes an advantageous embodiment of a hinge device arranged between a rear trunk lid of an inventive convertible vehicle and a tensioning bow for tensioning the rear side of a convertible top of the convertible vehicle, with which a pivoting movement of the tensioning bow, coordinated with the pivoting movement of the rear trunk lid, is realized.

[0009] The dependent claims 8 to 16 further develop the inventive hinge device in advantageous ways.

[0010] According to the inventive vehicle, there exists wide freedom with respect to the design; when the forward side of the rear trunk lid overlays the tensioning bow in its closed state, an elegant body structure of the closed convertible vehicle is achieved. The convertible top can be advantageously lowered, as a whole, to a level of, or underneath, the front side of the rear trunk lid.

[0011] The invention will be elucidated in the following with the help of exemplary schematic drawings and with further details.

[0012] The drawings show:

[0013] Figure 1 a side view of the rear half of a conventional convertible vehicle for clarifying the problem underlying the invention,

[0014] Fig. 2 a side view of an inventive convertible vehicle,

[0015] Fig. 3 a side view of the inventive vehicle with removed outer shell, partly in section, and a closed rear trunk lid as well as a closed convertible top,

[0016] Fig. 4 a view similar to Fig. 3 with a partly opened rear trunk lid,

[0017] Fig. 5 a view similar to Fig. 3 with a fully opened rear trunk lid,

[0018] Fig. 6 a view similar to Fig. 3 with a tensioning bow lowered due to the opened convertible top,

[0019] Fig. 7 a detail of the inventive hinge device,

[0020] Fig. 8 a side view, partly in section, of the rear half of a further embodiment of an inventive convertible vehicle,

[0021] Fig. 9 a view similar to Figure 8 with a rear trunk lid opened towards the rear and an upwardly pivoted tensioning bow,

- [0022] Fig. 10 a view similar to Figure 8 with a fully opened convertible top and a closed rear trunk lid,
- [0023] Fig. 11 a view similar to Figure 8 with a raised tensioning bow and a rear trunk lid opened towards the front,
- [0024] Fig. 12 a view similar to Figure 11 with a closed convertible top, and
- [0025] Fig. 13 a view similar to Figure 8 with a rear trunk lid fully opened in the rearward direction and
- [0026] Fig. 14 a view of the vehicle according to Figure 8 with the convertible top removed except for the tensioning bow.

[0027] In the following, the term "front" will be used for designating the forward direction of a convertible vehicle and the term "rear" will be used for designating the rearward direction of the vehicle; the lateral directions are the directions traverse to the vertical vehicle longitudinal midplane.

[0028] According to Fig. 1, a convertible vehicle, of which the rear half is illustrated in side view, comprises a vehicle body having a rear side portion 10 and a rear closing portion 12, wherein a trunk space is closable by a rear trunk lid 14 that is laterally and hingedly supported on the vehicle structure.

[0029] The vehicle comprises a convertible top 16, which is closed in the illustrated state, and which comprises a preferably foldable rear window 18; its rear end is attached in a known manner to a tensioning bow 20, which is tensionable by a not-illustrated hand or motor-actuable mechanism in a position, in which the convertible top is satisfactorily tensioned. As is apparent, the vehicle is constructed with a relatively short rear end, so that, in the area of the vehicle middle, the top side of the rear trunk lid 14, which is cut out corresponding to the tension bow 20, only slightly rearwardly extends beyond the tensioning bow and the trunk space will essentially be closed by the bent rear wall 24 of the rear trunk lid 14. So that the rear trunk lid 14 can be moved from a closed position, in which it clasps or overlays the tensioning bow 20 in a flush manner, into the illustrated opened position, a hinge mechanism 26 is provided in a known manner, and thus will not be further explained herein, by which means the rear trunk lid 22 is attached to the vehicle structure.

[0030] As is apparent, the loading capability of the trunk space is restricted by the wide rearwardly projecting tensioning bow 20.

[0031] To remedy this problem, the vehicle is inventively constructed as shown in Fig. 2, wherein the same reference numbers will be used in Fig. 2 as in Fig. 1 for the corresponding components, as far as these are not again explained.

[0032] As is apparent from a comparison of Fig. 2 with Fig. 1, the two vehicles primarily differ in that the tensioning bow 20 of the inventive vehicle is upwardly pivoted, so that the loading capability of the trunk space is significantly less restricted. This is achieved by a hinge device 30, which will be more precisely explained in the following with the help of Fig. 3 to 7.

[0033] In Fig. 3, the hinge device 30 is shown provided on the left side of the vehicle with reference to the vehicle longitudinal direction. Another, not-illustrated hinge device 30 is provided on the right side of the vehicle. The left-side wheel arch 32 of the vehicle body is schematically represented in Fig. 3. Further, the rear trunk lid 14 is visible in section with outer plate 34 and inner plate 36. The bottom of the rear trunk lid rests on the rear closure support 38, which also forms the loading edge.

[0034] The lower, rear side 40 of the convertible top 16 is attached to the tensioning bow 20 in a known manner, which bow 20 is formed by a bow-shaped metal profile that is supported on a lever 42 at the two respective forward ends of the bow; the lever 42 is pivotably connected with the vehicle body at the hinge 44.

[0035] The rear trunk lid 14 is pivotably supported by respective hinges 48 at a bearing support 50 via reinforcement parts 46 integrated into the forward ends of the rear trunk lid 14, the bearing support 50 being affixed to the vehicle body.

[0036] Behind and underneath the hinge 48 with reference to the vehicle, an overall L-shaped first pivot lever 54 is supported on the bearing support 50 at another hinge 52, whose one arm 56 extends approximately level towards the rear in the illustrated closed state of the rear trunk lid 14 and whose other arm 58 projects downwardly approximately perpendicularly from the hinge 52. A pneumatic spring 60 is engaged with the arm 56 approximately in the middle thereof; the pneumatic spring 60 is supported in a manner affixed to the vehicle body.

[0037] A second pivot lever 66 is pivotably supported on the free end of the arm 56 at the hinge 64; the second pivot lever 66 is inclined upwardly and forwardly in the illustrated, offset position and is pivotably connected with the rear trunk lid 14 at the hinge 68 (not portrayed in detail in Fig. 3).

[0038] For connecting said components with the tensioning bow 20, a coupling lever 72 is pivotably supported on the tensioning bow 20 in the illustrated position somewhat above the hinge 52 at the hinge 70; with a pin 74, the lever 72 projects into a recess 76 that is formed on

the free end of the arm 58 of the first pivot lever 54. The pin 74 forms a hinge axis, about which the coupling lever 72 is pivotable relative to the first pivot lever 54.

[0039] The coupling lever 52 [*sic*, 72] extends beyond the pin 54 and, on its free end, carries a roller 78 for contacting a guide surface 80 that is connected to the vehicle body. The function of the roller 78 and the guide surface 80 will be further explained below with the help of Fig. 7.

[0040] The function of the previously described components and hinge device is the following:

[0041] As shown in Fig. 4, when the rear trunk lid 14 is upwardly pivoted about the hinge 48, the hinge 68 is accordingly upwardly pivoted together with the rear trunk lid 14, wherein the angle between the second pivot lever 66 and the first pivot lever 54 increases and the first pivot lever 54 is pivoted about the hinge 52 in the counter-clockwise direction. As a result, the pin 74, which forms the hinged connection between the first pivot lever 54 and the coupling lever 72, initially moves along a circular arc underneath the hinge 70, so that the hinge 70 and thereby the tensioning bow 20 are initially barely raised; i.e. an initially large pivot angle of the rear trunk lid 14 is converted into a small pivot angle of the tensioning bow 20, so that the high tension force that acts upon the convertible top 16 is dissipated slowly and without an overly large torsion loading on the opening movement of the rear trunk lid 14. During this initial phase of the opening of the rear trunk lid 14, a latching lever 82 is pivoted further downwardly according to the described manner, such that the latching lever 82 latches the pin 74 in the recess 76, so that the pin 76 [*sic*, 74] does not come clear from the recess when the tension on the convertible top is decreased.

[0042] By further opening the rear trunk lid 14 (Fig. 5), its opening movement will convert into a pronounced pivoting of the tensioning bow 20 in the counter-clockwise direction due to the migration of the arm 58 radial to the hinge 70, so that when the rear trunk lid 14 is fully opened, the tensioning bow 20 is noticeably raised and the opening dimension L205 [*sic*, L206], i.e. the distance between the tensioning bow 20 and the loading edge formed by the rear closure support 38, is enlarged by a comfortable amount.

[0043] While the opening of the rear trunk lid is initially facilitated by the decreasing tension on the convertible top, the further opening of the rear trunk lid is then facilitated by the pneumatic spring 60, which reliably holds the rear trunk lid in its open position.

[0044] When closing the rear trunk lid, the described procedures are performed in the reverse order, wherein the convertible top is reliably tensioned again in the last phase of the closing of the rear trunk lid.

[0045] When the convertible top 16 is opened, it is stowed in the space in front of the forward side of the rear trunk lid 14, wherein the lever 42 is pivoted by lowering of the tensioning bow 20 in the clockwise direction and the convertible top is accommodated by filling the space between the tensioning bow 20 and the recess of the top side of the rear trunk lid 14, which recess normally encompasses the tensioning bow 20. By opening the rear trunk lid 14 in this opened and/or folded-together state of the convertible top 16, it is prohibited, for reasons of possible damage to the convertible top, that the tensioning bow 20 is raised by opening the rear trunk lid 14. So that this does not happen, the coupling lever 72 is moved by lowering of the tensioning bow 20 into its lowered, folding-top-accommodating position in a decoupled position, in which the hinged connection between the pin 70 of the coupling lever 72 and the first pivot lever 54 is released.

[0046] The decoupling procedure will be explained with the help of Fig. 7.

[0047] When the tensioning bow 20 is lowered, the roller 78, which is supported on the free end of the coupling lever 72, arrives in abutment with the guide surface 80 that is formed on a connecting member affixed to the vehicle body. By further lowering the coupling lever 72, the pin 74 reaches out of the recess 76 on the free end of the arm 58, which recess is preferably constructed with a cant 83 as shown in Fig. 7, so that the pin 74 comes free from the recess 76 and thereby from the first pivot lever 74 [*sic*, 54] and moves into the position shown in Fig. 6 by further lowering the tensioning bow 20. In this position, the first pivot lever 54 is completely decoupled from the coupling lever 72, so that the rear trunk lid 14 can be opened without the tensioning bow 20 somehow being moved therewith.

[0048] When the rear trunk lid 14 is closed as shown in Fig. 7, the latch lever 84 [*sic*, 82], which is clearly visible in Fig. 7, is pivoted into a position, in which the movability of the pin 74 out from the recess 76 is released. Thus, this will result in that the latch lever 82 is hinged on the arm 58 and is hinged at its other end (visible in Fig. 5) to an operation lever 84, which is hinged at 88 [*sic*, duplicate reference number with recess 88] with the second pivot lever 66 (Fig. 4 and 5). When the two pivot levers 54 and 56 [*sic*, 66] are pivoted from their maximum folded position shown in Fig. 3 by opening the rear trunk lid 14, the latch lever 82 is pivoted in the clockwise direction, so that the lower side of a recess 88, laterally formed on its end, catches the pin 74 and latches in the recess 76.

[0049] The described embodiment of the hinge device can be modified in many ways. For example, when the rear trunk is fully closed and the convertible top 16 is closed, the coupling lever 72 can take an "over" dead center position with respect to the hinge 52, so that the tension of the convertible top contributes to its closing during the very last closing phase of

the rear trunk lid and respectively this tension does not immediately pull in the opening position when the rear trunk lid is opened. The simple hinge 48, with which the rear trunk lid is supported on the vehicle body, can be replaced with a multi-lever or 4-bar linkage. The lever mechanisms can be replaced by other lever mechanisms having a corresponding object, with which a functional hinge device is created, by which the tensioning bow also will be opened by opening of the rear trunk lid, when the convertible top is closed. When the convertible top is opened, the rear trunk lid is openable without a movement or pivoting of the tensioning bow.

[0050] A further embodiment of an inventive convertible vehicle will be described in the following with the assistance of Figures 8 to 14. The same reference numerals will be utilized for functionally-similar components as the embodiment according to Figures 1 to 7.

[0051] According to Figure 8, for the convertible vehicle of the second embodiment, the rear lid 14, which is cut out in its forward area corresponding to the tensioning bow 20, is pivotably supported by a 4-bar linkage (not shown) on both sides in manner affixed to the vehicle body. The tensioning bow 20 is pivotably supported about an axis 90 on both sides of the vehicle body in a similar way. At least one downwardly projecting catch hook 92 is affixed to the tensioning bow 20; when the rear trunk lid 14 is downwardly pivoted, the hook 92 engages a corresponding catch bracket 94 affixed to the forward side of the rear trunk lid 14; the catch bracket 94 downwardly pivots the tensioning bow in the clockwise direction when the rear trunk lid 14 is being closed and thereby tensions the convertible top 16.

[0052] A plate- and/or tray-shaped hat rack is designated by 96, which is fit, for example, in the interior lining behind a back rest 98 of a rear seat of the vehicle. A fuel tank 100 can be arranged even with and behind the rear seat back rest 102 and preferably in front of the not-illustrated rear axis of the vehicle.

[0053] In the illustrated example, the tensioning bow 20 spans the entire U-shaped formed forward side of the rear trunk lid 14, which side corresponds to the tensioning bow 20, against which the tensioning bow 20 will press in sealing abutment following the engagement between the catch bracket 94 and the catch hook 92, which component will be provided by not-illustrated gaskets.

[0054] Figure 9 shows the arrangement according to Figure 8 when the tensioning bow 20 has been pivoted in the counter-clockwise direction and the rear trunk lid 14 has been pivoted in the clockwise-direction via a bearing in its rear area.

[0055] A hinged connection of the rear trunk 14 to the vehicle body is already known such that the rear trunk lid 14 is pivotable, on the one hand shown in Fig. 9, in the clockwise

direction about a bearing in its rearward area and is pivotable in the counter-clockwise direction about the bearing in its forward area (Figure 1), and thus will not be explained.

[0056] In the illustrated example, the pivotability of the rear trunk lid into the position shown in Figure 9 is necessary, so that the convertible top 16, which comprises relatively long linkage parts that are not illustrated in detail, can be moved into its fully opened position shown in Figure 10.

[0057] For opening the convertible top 16, the rear trunk lid 14 is initially pivoted into the position shown in Figure 9, wherein the catch bracket 94 comes out of the engagement with the catch hook 92, so that the tensioning bow 20 pivots in the counter-clockwise direction, e.g., due to the tension of the folding top. The convertible top 16 will then be opened in a known manner, wherein the lateral linkage parts move under the vehicle waist line in the rear area. The hat rack 96 can be brought into the illustrated lowered position shown in Figure 10 by means of a mechanism.

[0058] Figure 11 shows a operational state, in which the back rest 98 is folded onto the seat rest 1002, so that the upwardly facing rear side of the back rest 98 and the upper side of the tank 100 form an approximately level surface, on which surface a voluminous luggage piece 106 can be stowed in the luggage compartment that extends into the interior space of the vehicle.

[0059] It is understood that the hat rack 96, which obstructs the loading of luggage in the position shown in Figure 11 and in which the tensioning bow 20 is pivoted in the counter-clockwise direction, can be removed, or the hat rack 96 can be constructed such that it is fit in the tensioning bow 20, so that it raises together with the tensioning bow 20. When the rear trunk lid 14 is closed from the position shown in Figure 11, the catch bracket 94 again comes into engagement with the catch hook 92, so that the tensioning bow 20 is pivoted downwards under the tension of the folding top.

[0060] Figure 12 shows the position reached from the position shown in Figure 11 when the rear trunk lid 14 is fully closed.

[0061] Figure 13 shows an operational state of the vehicle corresponding to Figure 11, wherein the rear trunk lid 14 is however pivoted in the clockwise direction, so that the folding top 16 can be brought into the position shown in Figure 10 and can be fully opened. In this way, a luggage compartment that reaches into the vehicle interior space can be constructed, in which flat and very long objects can be accommodated.

[0062] Figure 14 shows a view of the vehicle in the state of Figure 12, wherein the folding top, with the exception of the tensioning bow 20, is not illustrated.

[0063] As is apparent, a traverse-loading dimension D is possible by suitable construction of the rear vehicle without a structural rear wall behind the back rest(s) 98, but rather, e.g., with a cross-beam 108 [*sic*, not identified in Fig. 14] remaining underneath the upper side of the tank, which cross-beam forms laterally projecting consoles 110, on which cross-beam the bearings of the rear trunk lid and the tensioning bow are affixed; the traverse-loading dimension D is given by the distance between the consoles 110. The consoles 110 advantageously include recesses 112 for a rigid, or extendible in a known manner in the case of a dangerous situation, roll bar 114 (not illustrated in the other figures), which by this means does not oppose traverse loading.

[0064] As is further apparent from Figure 14, two or more catch hooks 92 and catch brackets 94 are advantageously provided.

[0065] With the described embodiment, a large luggage loading opening, as well as a high traverse loading breadth, is made possible. The hat rack 96 can be, e.g., completely removable, so that a maximal loading capacity is available when the folding top is closed in combination with turned-down rear seat backs. The hat rack 96 can be, e.g. moved by hand or by motor from its raised position to its lowered position, wherein the lowered position can be detected by a sensor, which sensor indicates a free space for the storage of the convertible top. This is particularly advantageous for motorized actuation of the convertible top.

[0066] The described movements of the tensioning bow, the convertible top, the rear trunk lid and, if necessary, the hat rack can take place by purely manually operation. By the engagement between the rear trunk lid 14 and the tensioning bow 20 with assistance of the engagement device, i.e. the catch hook and catch bracket in the illustrated example, a separate movement of the tensioning bow 20 into the end position that tensions the convertible top is not required; rather, the end movement takes place directly by the closing of the rear trunk lid 14. The axes, about which the rear trunk lid and/or the tensioning bow move, can be kinematically supported by corresponding multi-link hinges, so that a more secure engagement between the catch hook 92 and the catch bracket 94 is ensured, even if the tensioning bow 20 is still located in a position noticeably pivoted vis-à-vis its rest position. Furthermore, actuators can be provided for the pivoting of the tensioning bow 20, the rear trunk lid 14 and, if necessary, for the movement of the hat rack 96 and/or the folding-over of the back rests 98; the actuators can be controlled in a coordinated manner by a control device.

[0067] The features of the exemplary-described embodiments can be modified, provided the respective desired goal is fulfilled, and combined with each other in various ways. For example, an engagement mechanism with catch hooks and catch brackets can be provided for

the first-described embodiment. For the second-identified embodiment, the tensioning bow and the rear trunk lid can be constructed such that the rear trunk lid 14 overlaps the tensioning bow 20 from behind and above, which results in a particularly elegant appearance of the vehicle.

Reference Number List

| | |
|----|----------------------|
| 10 | Side Part |
| 12 | Rear Closure Part |
| 14 | Rear Trunk Lid |
| 16 | Convertible Top |
| 18 | Rear Window |
| 20 | Tensioning Bow |
| 22 | Upper Side |
| 24 | Rear Wall |
| 26 | Hinge Mechanism |
| 30 | Hinge Device |
| 32 | Wheel Arch |
| 34 | Outer Plate |
| 36 | Inner Plate |
| 38 | Rear Closure Support |
| 40 | Side |
| 42 | Lever |
| 44 | Hinge |
| 46 | Reinforcement Part |
| 48 | Hinge |
| 50 | Bearing Support |
| 52 | Hinge |
| 54 | Pivot Lever |
| 56 | Arm |
| 58 | Arm |
| 60 | Pneumatic Spring |
| 62 | Bearing |
| 64 | Hinge |
| 66 | Pivot Lever |
| 68 | Hinge |
| 70 | Hinge |
| 72 | Coupling Lever |
| 74 | Pin |

| | |
|-----|-----------------|
| 76 | Recess |
| 78 | Roller |
| 80 | Guide Surface |
| 82 | Latching Lever |
| 84 | Operation Lever |
| 86 | Hinge |
| 88 | Recess |
| 90 | Axis |
| 92 | Catch Hook |
| 94 | Catch Bracket |
| 96 | Hat Rack |
| 98 | Back Rest |
| 100 | Fuel Tank |
| 102 | Seat Rest |
| 106 | Luggage Piece |
| 108 | Cross-Beam |
| 110 | Console |
| 112 | Receptacle |
| 114 | Roll Bar |